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The role of side chains in electron transfer induced fragmentation of amino-acids

F Ferreira da Silva[1], J Rafael[2], A Rebelo[3], D Almeida[4] and P Limão-Vieira[5]

Laboratório de Colisões Atómicas e Moleculares, CEFITEC, Departamento de Física,
Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa, 2829-516 Caparica, Portugal

Synopsis We present negative ion formation driven by electron transfer in atom (K) molecule (amino acids) collisions, probing the influence of side chains in the decomposition mechanism.

The role of low energy electrons (LEEs) in the damaging capability of biological components has been the key point of many investigations. The seminal studies of Sanche and co-authors [1] proved for the first time that LEE impact on DNA/RNA induces single and double strand breaks that may lead to mutagenesis. As so, we have observed several gas phase studies that were carried out with different related molecules through dissociative electron attachment experiments. In the last few years, special attention has been given to electron transfer processes in potassium molecule collisions, where these have been proposed to describe more realistic the underlying processes involving interaction with biological related constituents.

Several studies have been performed in order to understand and compare how electron transfer can induce fragmentation in several DNA/RNA constituents and biological relevant molecules [2, 3]. In this communication, we present negative ion formation upon potassium collisions with different amino acids, in order to understand how the side chain can influence the fragmentation patterns. The results show that dissociation channels are dictated by the collision energy, and may differ strongly from DEA studies. In figure 1, we show the results on the anion formation of tyrosine, an aromatic side chain amino acid. Tryptophan and phenylalanine were also studied in order to understand the influence of delocalized π electrons by the aromatic ring, which may dictate the fragmentation pathways. We observe an increase of lighter fragments with increasing collision energy and a strong decrease of dehydrogenated parent anion formation.

This study was performed by means of a crossed molecular beam setup, where a neutral hyperthermal potassium beam crosses with an effusive molecular target. The negative ions formed in the collision region were then accelerated into a TOF mass spectrometer.

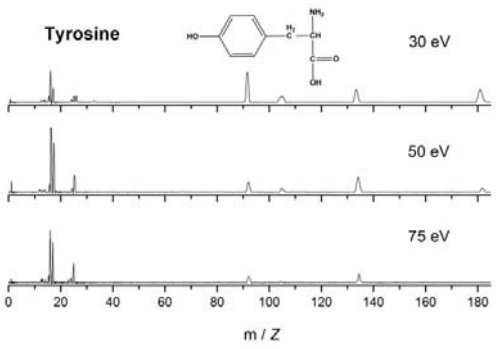

Figure 1. Anion mass spectra for 30, 50 and 75 eV potassium impact on tyrosine.

References

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[1] E-mail: f.ferreiradasilva@fct.unl.pt
[2] E-mail: j.rafael@campus.fct.unl.pt
[3] E-mail: afc.rebelo@campus.fct.unl.pt
[4] E-mail: dalmeida@campus.fct.unl.pt
[5] E-mail: plimaovieira@fct.unl.pt